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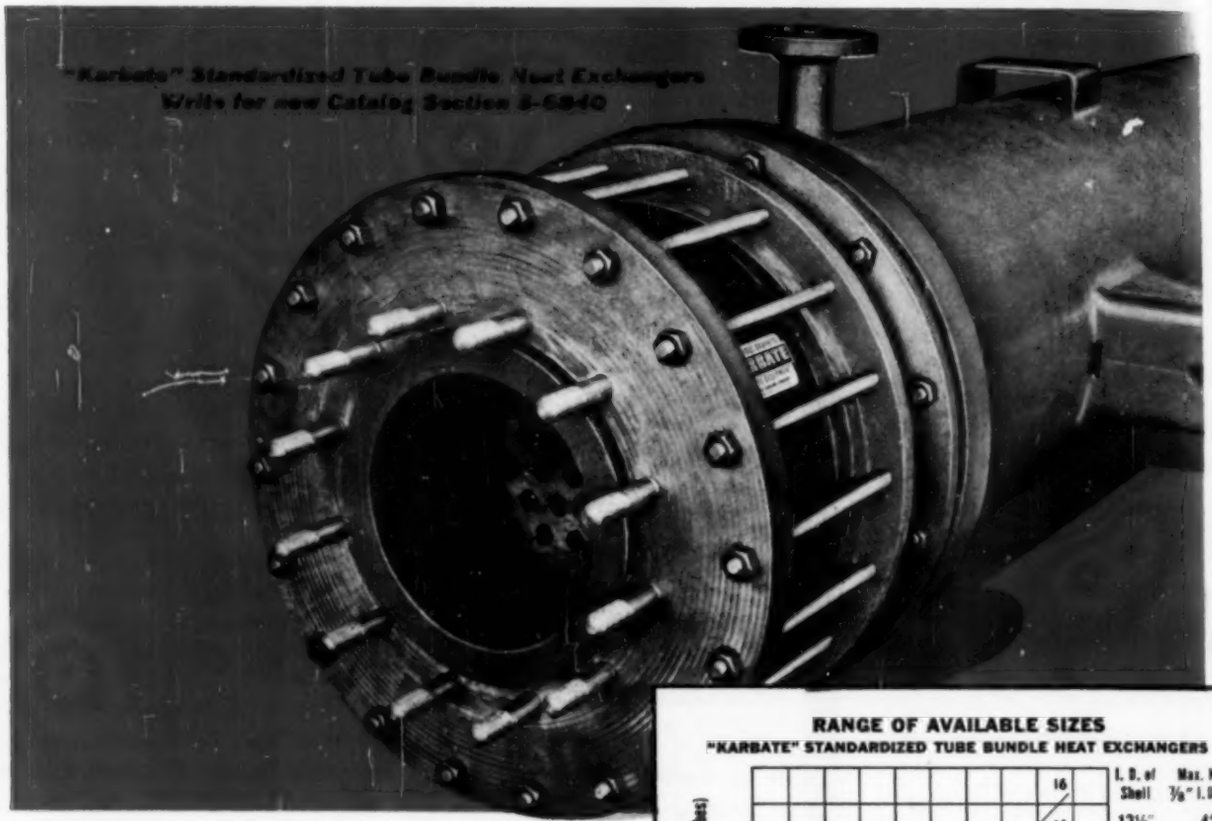

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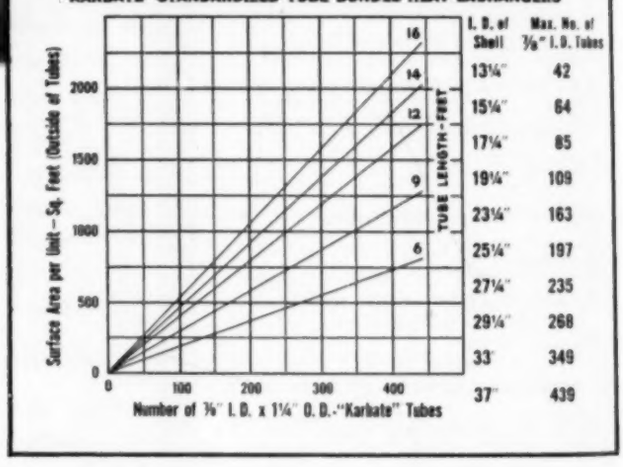

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Editorial

Preservation of the Metallic State

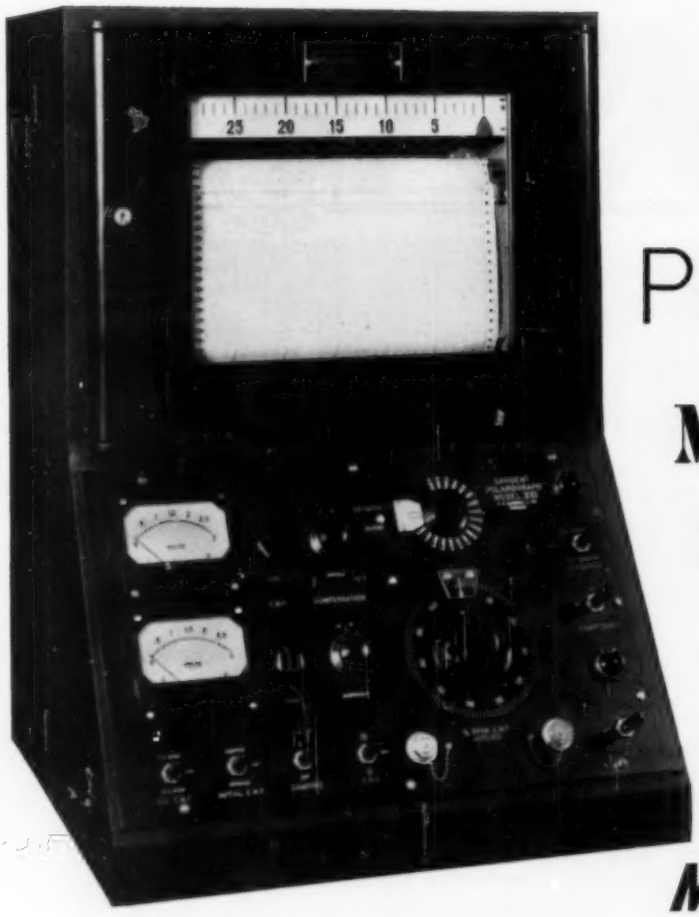
BIBLICAL scholars will recall the passage associating rust with moths in the corruption of the treasures of the earth.* Despite this unlovely connotation, processes by means of which metals revert to the compounds from which they were obtained by extractive metallurgy are respectable chemical reactions. There is no mystery about them; when pure metals are exposed to simple and known environments, chemical or corrosion reactions that take place can be predicted and are well understood. Most of the confusion and uncertainty about corrosion arises from ignorance of the composition of the metal and the elements and compounds of its environment that may give rise to these chemical reactions. Most practical environments are very complex and contain many constituents that may react with most metals. The problem of the corrosion chemist generally consists in identifying the controlling variable in a corrosion process, and devising a practical method of inhibiting the reaction.

Metallurgists pursue the interesting task of enticing metals from their natural state by schemes requiring ingenuity and often considerable energy. The achievement of the metallic state is relatively simple, however, compared with that of maintaining it in a chemically reactive world. Metallurgists in extracting metals from their ores generally deal with known variables in reasonably well closed systems. Corrosion engineers are confronted with the far more difficult task of preserving the metallic state in surroundings where variables are complex, compounded, and uncontrolled. Under these circumstances, it would seem fair to suggest that metallurgists devote themselves to making metals like titanium with corrosion resistance built in and alloy steels that, in addition to being stainless, can be made into knives that will take and maintain a sharp edge.

No one will minimize the problem of corrosion in this rapidly expanding metallic age. The annual wastage of metals by corrosion is enormous, yet it represents but a small proportion of the metals in use. Corrosion losses would be reduced drastically if existing knowledge were more generally applied. Corrosion is all too often the consequence of carelessness. Actually, great advances have been made in the control of corrosion by accumulating knowledge of metallic behavior in known environments, by treating corrosion as a chemical problem, and by drawing upon the chemical industry for the raw materials of protective coatings. If metallurgists cannot preserve the metallic state, chemists will.

—RMB

* Matthew VI, 19.



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"reciprocal relations" formulated by Onsager. In essence, the relations specify certain equalities among the various "rate constants" appearing in the equations describing the rate at which these processes take place. The proper constants are obtained when the flux equations are written as linear functions of all driving forces. In a binary mixture of A and B, in which diffusion is taking place because of concentration gradients, the reciprocal relations require that the diffusion coefficient of A with respect to B must equal that of B with respect to A. The reciprocal law is strictly true only for small departures from equilibrium. It was brought out in the discussion that although the rate equations themselves may hold over large departures from equilibrium, the "constants" may no longer be constant for large driving forces. For example, diffusivities may be functions of concentration.

Professor deBethune showed how these new concepts could be used to derive several well-known relationships—among them, the rate of heat dissipation in a conductor, the liquid junction potential at an interface between a salt such as KCl at two different concentrations, and the potential of a concentration cell. He indicated that one of the fields of usefulness of this method of attack upon new problems lies in the light it throws on the interrelationships between simultaneous phenomena, such as electro-osmosis, streaming potential, and capillary flow of an electrolyte.

The equations relating the pressure difference, potential difference, and flow of material and energy in a cell diaphragm were cited.

In the discussion period it was pointed out that the power of the concepts of the thermodynamics of irreversible process (or "thermodynamics of the steady state," as it is sometimes called) is still in a rapidly developing stage.

The membership was informed that Wednesday, May 12, 1954, is Ladies' Night. The Section has been fortunate in securing Dr. H. N. Alyea to give his talk on "Atomic Energy: Weapon for Peace."

JOHN W. HOOPES, JR.

Philadelphia Section

Mr. L. E. Lighton, Vice President in Charge of Engineering with the Electric Storage Battery Company, addressed the January 6, 1954, meeting of the Philadelphia Section on "The Role of the Positive Grid and its Alloy in the Lead Acid Secondary Battery."

Mr. Lighton first pointed out that the results of several comprehensive studies of storage batteries in automobile service show two principal reasons for failure. The electrolytic corrosion of the positive grid structure always accounts for more than half of the failures. The second most important cause is "negative sulfation" and is usually

L. E. LIGHTON

the principal cause in about 25% of the batteries examined.

Effective inhibitors have been found which when added to the positive grid metal are successful in reducing the rate of corrosion of the antimonial lead alloy. Silver when addded to 6% antimonial lead alloy increases the corrosion resistance as much as 70%. A similar effect is obtained by the addition of arsenic. When silver and arsenic are both added to an antimonial lead grid alloy, its resistance to electrolytic corrosion is increased in a manner never before attained.

A photographic comparison of test plates indicated conclusively that grid metal containing silver and arsenic maintained its original shape with all grid members in place and showed practically no grid wear after being subjected to an overcharge test; whereas, the 6% antimonial grid was distorted, broken, and had all its horizontal bars corroded.

These corrosion inhibitors, by their reduction in positive grid metal attack, materially prevent negative plate sulfation. Results from an accelerated sulfation test indicated that batteries built with these improved alloys maintained their ability to discharge at high rates and low temperatures, three times as long as batteries built with alloys customarily used in battery manufacture. Extensive field service tests of these new alloys are showing remarkable improvement in battery life and performance.

Mr. Lighton, who is a member of the Philadelphia Section, was guest of honor at a social hour and dinner at the Lenape Club preceding the talk.

GEORGE W. BODAMER, *Secretary*

Washington-Baltimore Section

On January 21 the 22nd technical meeting of the Washington-Baltimore Section was held at the National Bureau of Standards.

The speaker was Mr. E. S. Malkin, of the National Carbon Company, who showed two sound-color films: (*a*) "Meeting the Challenge" and (*b*) "By Way of Experience." These two excellent films described the properties, manufacture, applications, installation, and maintenance of Karbate impervious graphite equipment. After the showing of the films, Mr. Malkin answered numerous questions about Karbate and Karbate equipment.

FIELDING OGBURN, *Secretary*

NEW MEMBERS

In February 1954 the following were elected to membership in The Electrochemical Society:

Active Members

IAN D. G. BERWICK, British Columbia Research Council, at the University of British Columbia, Vancouver, B.C., Canada (Corrosion)

JAMES G. BICKEL, Gahagan, Inc., 326 S. New St., Bethlehem, Pa (Electronics), Formerly Associate Member

MARVIN R. BOTHWELL, Dow Chemical Co., mailing add: 4034 Elm Lane, Rt. 4, Midland, Mich. (Corrosion)

FELIX BOURDILLIAT, Ministerie Industrie et Commerce, mailing add: 37 Rue du Docteur Roux, Paris, France (Electronics, Electro-Organic, Electrothermic, Industrial Electrolytic, and Theoretical Electrochemistry)

ROBERT H. COLEMAN, National Distillers Chemical Co., State Road, Ashtabula, Ohio (Industrial Electrolytic)

GILMORE E. CROSBY, Radio Corporation of America, Lancaster, Pa. (Electronics)

CHANNING DICHTER, General Electric Co., mailing add: 909 Westcott St., Syracuse, N. Y. (Electronics)

MORRIS EISENBERG, Stanford Research Institute, mailing add: 335 High St., Palo Alto, Calif. (Corrosion, Electrodeposition, Industrial Electrolytic, and Theoretical Electrochemistry), Formerly Associate Member

ROBERT C. FORD, Oldbury Electrochemical Co., mailing add: 110 Carl Rd., Grand Island, N. Y. (Industrial Electrolytic)

RICHARD GLICKSMAN, RCA Laboratories Division, Princeton, N. J. (Battery, Corrosion, and Theoretical Electrochemistry), Formerly Student Associate Member

JOHN M. GREGORY, National Distillers Chemical Co., Ashtabula, Ohio (Industrial Electrolytic)

WILLIAM W. GULLETT, Chicago Development Corp., mailing add: 6903 Baltimore Ave., College Park, Md. (Battery), Formerly Associate Member

EMORY B. MICHEL, Pittsburgh Steel Co., mailing add: 1081 Clearview N. W., Warren. Ohio (Electrodeposition), Formerly Associate Member

FRED W. PONZAR, National Bearing Division, American Brake Shoe Co., 4930 Manchester, St. Louis, Mo. (Electrodeposition)

JOHN L. ROBINSON, Dow Chemical Co., mailing add: 4245 Bay City Rd., Midland, Mich. (Battery)

ROY H. SMITH, Boeing Airplane Co., Seattle, Wash. (Electrodeposition and Corrosion)

Reinstatement

OTTO KAY, Sam Tour & Co., Inc., mailing add: 34-21 77 St., Jackson Heights, N. Y. (Battery, Corrosion, and Industrial Electrolytic)

Associate Members

CHARLES L. KINGREA, Ethyl Corporation, mailing add: 7169 Joliet Ave., Baton Rouge, La. (Industrial Electrolytic)

ROBERT A. OSTERYOUNG, University of Illinois, mailing add: 1107 West Green, Apt. 321, Urbana, Ill. (Theoretical Electrochemistry)

Student Associate Members

ROGER A. COVERT, Massachusetts Institute of Technology, Corrosion Laboratory, Rm. 8-206, Department of Metallurgy, Cambridge, Mass. (Corrosion)

RICHARD A. STREHLOW, University of Illinois, mailing add: 300 S. Goodwin, Apt. 108, Urbana, Ill. (Electro-Organic)

Resignations

J. E. DRAPEAU, JR., The Glidden Co., Chem. & Pigment Div., P. O. Box 300, Hammond, Ind.

F. H. EDELMAN, 8229 Pickering St., Philadelphia, Pa.

H. R. FRIEDBERG, 9801 Lake Ave., Cleveland, Ohio

OLIVER A. SHORT, E. I. du Pont de Nemours & Co., Inc., Niagara Falls, N. Y.

PERSONALS

ROBERT V. JELINEK is now assistant professor, Department of Chemical Engineering, Columbia University, New York. He was formerly with the Development Division of Standard Oil Development Company, Linden, N. J.

MARCELLO PIRANI, previously scientific consultant in Surrey, England, has accepted a position as scientific consultant with a branch of the Westinghouse Electric Corporation, München, Germany.

THOMAS P. MAY, Corrosion Engineering Section, Development & Research Division, International Nickel Company, Inc., New York City, has been elected a Director, representing active members, of the National Association of Corrosion Engineers.

MANUSCIPTS AND ABSTRACTS FOR FALL MEETING

Manuscripts are now being received for the Fall Meeting of the Society, to be held at the Statler Hotel in Boston, October 3, 4, 5, 6, and 7, 1954. Subjects to be covered at the technical sessions will be Battery, Corrosion, Electrodeposition, and Electrothermics.

To be considered for this meeting, triplicate copies of manuscripts or abstracts (not to exceed 75 words in length) must be received at Society headquarters, 216 West 102nd Street, New York 25, N. Y., *not later than July 15, 1954.*

AARON WACHTER, currently vice-president of the National Association of Corrosion Engineers, has been elected president of the Association. Mr. Wachter is with the Shell Development Company, Emeryville, Calif.

IRVING A. DENISON, Diamond Ordnance Fuze Laboratories, Washington, D. C., was selected by the National Association of Corrosion Engineers to receive the 1954 Willis Rodney Whitney Award in recognition of his outstanding contributions to the science of corrosion.

ROBERT D. NUTTING is now director of the Metallurgical Research Laboratories, Reynolds Metals Company, Richmond, Va. Mr. Nutting had been associated with E. I. du Pont de Nemours & Company, Inc., Newport, Del., as production and research supervisor of the Pigments Department.

A. E. MIDDLETON, former Chief of the Semiconductor and Dielectrics Division, Battelle Memorial Institute, Columbus, Ohio, has been appointed Chief of the Physics Laboratories, Central Research Division, P. R. Mallory & Company, Inc., Indianapolis, Ind. The Physics Laboratories will combine the Central Research Division activities in semiconductors, physics of materials, and solid state physics.

ROBERT BRUCE, previously at the National Bureau of Standards, Washington, D. C., has joined the staff of the Diamond Ordnance Fuze Laboratories, a field installation of the Ordnance Corps, Department of the Army, Washington, D. C.

RECENT PATENTS

Selected for electrochemists by Fred. W. Dodson, Chairman of the Patent Committee, from the Official Gazette.

January 5, 1954

Clough, P. J., and Chadsey, E. E., 2,665,223, Process for Depositing an Aluminum Film on a Substrate by Thermal Vaporization

Clough, P. J. and Godley, P., II, 2,665,224, Process for Vapor Coating

Godley, P., II, 2,665,225, Apparatus and Process for Coating by Vapor Deposition

Godley, P., II, Clough, P. J., and Stauffer, R. A., 2,665,226, Method and Apparatus for Vapor Coating

Clough, P. J., and Godley, P., II, 2,665,227, Apparatus and Method of Coating by Vapor Deposition

Stauffer, R. A., 2,665,228, Apparatus and Process for Vapor Coating

Schuler, F. W., Mansir, W. W., and Di Pietro, W. O., 2,665,229, Method of Coating by Vapor Deposition

Amundsen, P. L., and Osip, W. A., 2,665,231, Coating Process with Alkali Metal Phosphate and Added Fluoride Salt

Neish, R. A., 2,665,232, Method and Solution for Treating Zinc Surfaces to Inhibit Formation of White Rust

Young, G. W., and Hain, J. L., 2,665,243, Method of Providing Aluminum with a Flexible Oxide Coating

Menegoz, C. D., 2,665,244, Refining Aluminum Electrolytically

Schaltegger, H., 2,665,245, Photochemical Production of 7-Chlorocholesteryl Ester

Bates, J. R., 2,665,246, Electrostatic Sludge Precipitation

Jumer, J. F., 2,665,247, Apparatus for Electropolishing Metals

Herres, S. A., 2,665,318, Arc Melting of Titanium to Form Ingots

Dreyfus, L., 2,665,319, Metallurgical Furnace Having a Stirring Winding

Chadsey, E. E., Clough, P. J., and Godley, P., II, 2,665,320, Metal Vaporizing Crucible

Flagg, R. P., 2,665,321, Thermoelectric Generator

MacDonald, D. H., 2,665,322, Method of Making Thermocouples

McFarlane, T. P., and Konig, O., 2,665,323, Negative Plate Material for Storage Batteries

McFarlane, T. P., 2,665,324, Manufacture of Storage Batteries

Welter, O., 2,665,325, Accumulator Cell

Knight, M. A., 2,665,326, Vent Plug and Electrolyte Leveling Device for Aircraft Storage Batteries

Martin, J. R., 2,665,327, Electrolyte Level Indication in Electrical Accumulators

Eding, H. J., and Glassbrook, C. I., 2,665,412, Analysis of Nonferrous Alloys

January 12, 1954

Schaaber, O., 2,666,023, Anodic Coating of Aluminum

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Low, F. S., 2,666,024, Oxidation and Chlorine Recovery Process

Nozaki, K., 2,666,025, Process for Polymerizing Vinyl-Type Compounds by Irradiation

Gibbs, L. T., 2,666,026, Corrosion Inhibitor

Vallett, W. I., 2,666,027, Anode for Cathodic Protecting Systems

Silsby, C. C., Jr., 2,666,028, Electrolytic Cell for the Electrolysis of Brine

De Quasie, L. G., and Kochs, R. E., 2,666,029, Electrode for Chromium Plating

Johansson, F. C. E. and Tiberg, M. G. G., 2,666,087, Mantle for Continuous Electrodes

Lincoln, A. J., 2,666,088, Method for Bonding Resistors in Electric Furnaces

Gier, J. T., and Dunkle, R. V., 2,666,089 Hemispherical Radiometer Sensing Unit

Aske, I. E., 2,666,090, Thermocouple

Martin, E. L., and Agee, H. H., 2,666,091, Electric Storage Battery for Use in Extreme Climates

January 19, 1954

Kadell, A. E., 2,666,716, Method for Applying a Liquid Film to Strip-Like Material

Kardos, O., 2,666,738, Bright Silver Plating

Packie, J. W., 2,666,739, Electrical Coalescence Process

Barsy, I. J., 2,666,799, Temperature-Sensing Method and Unit

Hoynes, D. S., 2,666,800, Method and Device for Interconnecting Battery Cells

Vi reen, J. A., 2,666,80[illegible] Electric Battery and Method of Ma[illegible]ng Same

Woodring, W. B., and Eato[illegible] W. W., 2,666,802, Lamellate Flat [illegible]ell

Kurlandsky, S., 2,666,803, Ba[illegible]tery with Conductive Wax Intercell Connections

Stutsman, P. W., 2,666,880, Gaseous-Discharge Device

Guelpa, J. P., 2,666,883, Method of and Apparatus for Automatically Charging Accumulator Batteries

January 26, 1954

Muller, W., and Kircher, H., 2,667,405, Production of a Manganese Dioxide for Use as Depolarizer in Dry Cells

Murray, G. E., 2,667,453, Method of Electroplating Copper on Metal Articles

Roller, P. S., 2,667,454, Electrolytic

Method and Apparatus for Production of Metal Hydroxides

Aannerud, S. A., and Mostad, E., 2,667,455, Method for Electrolytic Production of Iron from Iron Sulfate Solutions

Young, C. F., 2,667,456, Chemical Process for Retaining Cutting Edges

Henderson, E. F., 2,667,523, Apparatus for Manipulating Soderberg Electrodes

Dreyfus, L., Thelemarck, T., Beckius, I., and Lindstrom, H., 2,667,524, Induction Heating Furnace

Hersch, P., 2,667,525, Alkaline Storage Battery

Stumbock, M. J., 2,667,526, Method of Making Nickel-Cadmium Batteries

Pucher, L. E., 2,667,527, Deferred Action Battery

LITERATURE FROM INDUSTRY

"Dehydrating Equipment." 48-page catalogue illustrates the newest innovations in the field of dehydrating and dewatering equipment. A number of installations are pictured in operation. Cross sections, detailed drawings, and easy-to-read tables supplement each section. Types of materials particularly suited to mechanical removal of excess moisture are discussed. A copy of the catalogue will be mailed to anyone requesting it on his company's stationery. Davenport Machine and Foundry Co. P-198

Frequency Meters. Data sheet gives information and specifications on all models of frequency meters of the manufacturer which have been designed for both field and laboratory use. The units are supplied complete with microammeter, sensitivity control, and calibration charts, all mounted in a hardwood carrying case with a removable lid. Frequency Standards. P-199

Electrical Measurements. Bulletin entitled "Electrical Measurements" describes the manufacturer's latest Multirange a-c, d-c current and voltage measuring instrument called the "Universal 88," which features 88 internal ranges in current and voltage. The ranges overlap each other so that all readings can be taken on the upper half of the scale. Sensitive Research Instrument Corp. P-200

Transistors. Recently issued technical folder entitled "Power Supplies for Transistors" is available. Information given includes requirements and features of batteries for transistor circuits. Several charts illustrate discharge curves for various types of cells. Burgess Battery Co. P-201

NEW PRODUCTS

H-VW-M Selenium Rectifier. A heavy-duty, selenium rectifier specially designed for use in plating and other metal finishing operations is pictured and described in a new bulletin. Besides combining a number of desirable features in one design, this rectifier is uniquely equipped with terminal tiebars that permit output voltage to be changed without any change in bus arrangements. The booklet tells what type of current and ripple is delivered by the instrument; it also gives information on models available, costs, operating capacity, sizes, type of input, and kind of current switching. Hanson-Van Winkle-Munning Co. N-58

Nuclear Spectrometer. It now is possible to analyze minute samples of substances ranging from chemicals to metallic alloys with a newly developed instrument called a nuclear spectrometer, which enables scientists to detect and measure materials in amounts far below the limits of other methods. Based on various radiation detectors, including the proportional counter and the scintillation counter, the spectrometer has extreme sensitivity and resolution. Because of its ability to discriminate between radiations of different energies and kinds (alpha, beta, gamma, or x-rays), it can be used to detect and analyze many elements in various states of composition. Armour Research Foundation of Illinois Institute of Technology. N-59

D-C Magnetic Amplifier. The output of a low level d-c device, such as a thermocouple phototube, strain gauge, or thermistor bridge, can now be amplified sufficiently to operate an insensitive meter or relay through use of the Type 806 low level magnetic amplifier. It will operate from input signals as low as 200 micro micro watts and will provide an output of 0.05 watt of reversible polarity to a 50-ohm load. A power gain

ELECTROCHEMIST

Major electrochemical producer located in deep south needs man to assume responsibility for experimental phase of development program on fused salt electrolysis. Must have several years' experience in laboratory or plant development of fused salt or other electrolytic cells. This position requires more than average drive, imagination, and creative ability. At least B.S. degree in chemistry, chemical engineering, or related field is required. Interested persons are requested to submit full details of their qualifications to

Box 'A-254.

of approximately 300,000 can be obtained. Completely self-contained and requires no additional rectifiers or power supply. Operates from 115 volts, 60 cycles, single phase. Polytechnic Research & Development Co., Inc. N-60

MICRO GRAM-ATIC BALANCE. A new micro balance, which weighs to 2 millionths of a gram in 35 seconds, is available. Features include: high speed and accuracy, single-pan design, two knife edges instead of three, fast air damping instead of magnetic damping, automatically registering weights, easy operation. Original sensitivity is high and remains constant throughout the weight range of the balance. Fisher Scientific Co. N-61

MULTIPLIER PHOTOTUBES. Two multiplier phototubes—one promising smaller, more economical headlight-dimming equipment, the other for rapid nuclear radiation detection service—have been announced. The new headlight-dimming phototube is a nine-stage type, with instantaneous response essential for the critical timing requirements of automatic off-on light control. Features are high luminous sensitivity and low electrode dark current. The second phototube, characterized by short-time-resolution capability, is designed for use in scintillation counters for the detection and measurement of nuclear radiation, and in other applications involving the measurement of low-level, large-area light sources. Radio Corporation of America. N-62

PYROMETER CONTROLLERS. The range of applications for millivolt-type pyrometer control instruments of the manufacturer has been broadened by the addition of millivolt actuation. The measuring circuits of the instruments have been modified to permit calibration of the instrument for a number of functions, including measuring and controlling speed of rotation, power consumption, pressure, or relative acidity or alkalinity. Accurate to within 1%, the indicating controllers can be used with any sensing element whose output is of the proper order of magnitude. Minneapolis-Honeywell Regulator Co. N-63

GRANULAR BISMUTH METAL is now available as a Fisher *Certified* Reagent, with the high purity verified by a lot-analysis on each bottle. In every lot, actual analysis shows impurities of less than 0.0005% arsenic; 0.002% copper; 0.002% iron; 0.005% lead; and 0.01% antimony. Intended to permit more exacting control in manufacturing-research studies of the various products in which bismuth figures. These include "silvered" mirrors and low-melting-point alloys in electric fuses and solders. Fisher Scientific Co. N-64

COPPER TO PLASTIC ADHESIVE. A new "adhesive-clad-copper" process offers bond strengths on copper-to-thermosetting sheets of up to 35 lb per inch. The adhesive, trade named R & A "plymaster," is supplied precoated on Anaconda electrolytic sheet copper and cut-to-size, with both the copper sheet and the adhesive application pre-inspected before packing. The adhesives are available in two basic formulations: Type "N" for adhering copper sheet to a phenolic resin base to pass the 200°C "solder dip test"; and Type "E" to pass the 235°C "solder dip test" and also for use with epon or silicone base laminates. Rubber & Asbestos Corp. N-65

PLATING CYLINDERS. Colorful 4-page bulletin gives first detailed close-up of the complete line of "H-T Sincolite" Replacement Plating Cylinders claimed to "fit any plating barrel superstructure . . . new or old." Outlined are the several features exclusive with the various models offered. A novel and convenient "Specifications Diagram" is inserted in the bulletin, providing the plater with a cylinder drawing on which his cylinder dimension can be marked and returned for quotation. The Singleton Co. N-66

MAGNETIC AMPLIFIERS. An 8-page technical data booklet on current and potential transductor magnetic amplifiers is available upon request. A section covering application specifications is included to establish terminology for the operating characteristics. This information specifies the conditions necessary for proper operation and, in general explains effect of deviations from the specified conditions. Complete operating characteristics, including graphs showing rated control current vs. output current of three transductor magamps, are tabulated for easy reference. Westinghouse Electric Corp. N-67

RECORDING HOOK-ON VOLT-AMMETER. A portable recording instrument for obtaining a permanent record of alternating current and voltages has been developed. The new volt-ammeter (Type CF-7) combines features of a self-latching multirange hook-on current transformer and the simplicity of the Type CF inkless recorder in equipment suitable for indoor and outdoor applications. Particularly useful for checking loads on distribution lines, verifying motor loads, and in detecting overload circuits, transformers, motors, and other a-c apparatus. General Electric Co. N-68

To receive further information on any New Product or Literature from Industry listed above, send inquiry, with key number, to JOURNAL of The Electrochemical Society, 216 West 102nd Street, New York 25, N. Y.

Please print your name and address plainly.

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RESEARCH CHEMIST, M.S., age 33. Physical and organic chemistry background. Business administration training, Alexander Hamilton Institute. Six years' diversified industrial experience. Selenium rectifiers, germanium rectifiers, electrochemistry, and fine organics. Desires interesting position in the New York—New Jersey—Connecticut area. *Reply to Box 354.*

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Address all correspondence to the Editor, JOURNAL OF THE ELECTROCHEMICAL SOCIETY, 216 W. 102nd St., New York 25, N. Y.

FORM

Manuscripts submitted for publication should be in triplicate to expedite review. They should be typewritten, double-spaced, with 2½–4 cm (1–1½ in.) margins.

Title should be brief, followed by the author's name and his business or university connection.

Abstract of about 100 words should state the scope of the paper and give a brief summary of results.

ILLUSTRATIONS

Drawings will be reduced to column width, 8 cm (3⅛ in.), and after reduction should have lettering at least 0.15 cm (1/16 in.) high. Original drawings in India ink on tracing cloth or white paper are preferred. Curves may be drawn on coordinate paper only if the paper is ruled in blue. All lettering must be of lettering-guide quality. See sample drawing on reverse page.

Photographs must be glossy prints and mounted flat.

Captions for all figures must be included on a separate sheet. Captions and figure numbers should not appear in the body of the figure.

General—Figures should be used only when necessary. Omit drawings or photographs of familiar equipment. Figures from other publications are to be used only when the publication is not readily available, and should always be accompanied with written permission for reprinting.

REFERENCES

Literature and patent references should be listed at the end of the paper on a separate sheet, in the order in which they are cited. They should be given in the style adopted by *Chemical Abstracts*. For example:

R. Freas, *Trans. Electrochem. Soc.*, **40,** 109 (1921).

H. T. S. Britton, "Hydrogen Ions," Vol. **1,** p. 309, D. Van Nostrand Co., New York (1943).

H. F. Weiss (To Wood Conversion Co.), U. S. Pat. 1,695,445, Dec. 18, 1928.

UNITS OF MEASUREMENT

Metric units should be used throughout but, where desirable, English units may be given in parentheses.

Corrosion rates in the metric system should preferably be expressed as milligrams per square decimeter per day (mdd), and in the English system as inches penetration per year (ipy).

As regards algebraic signs of potentials, the standard electrode potential for $Zn \rightarrow Zn^{++} + 2e$ is negative; for $Cu \rightarrow Cu^{++} + 2e$, positive.

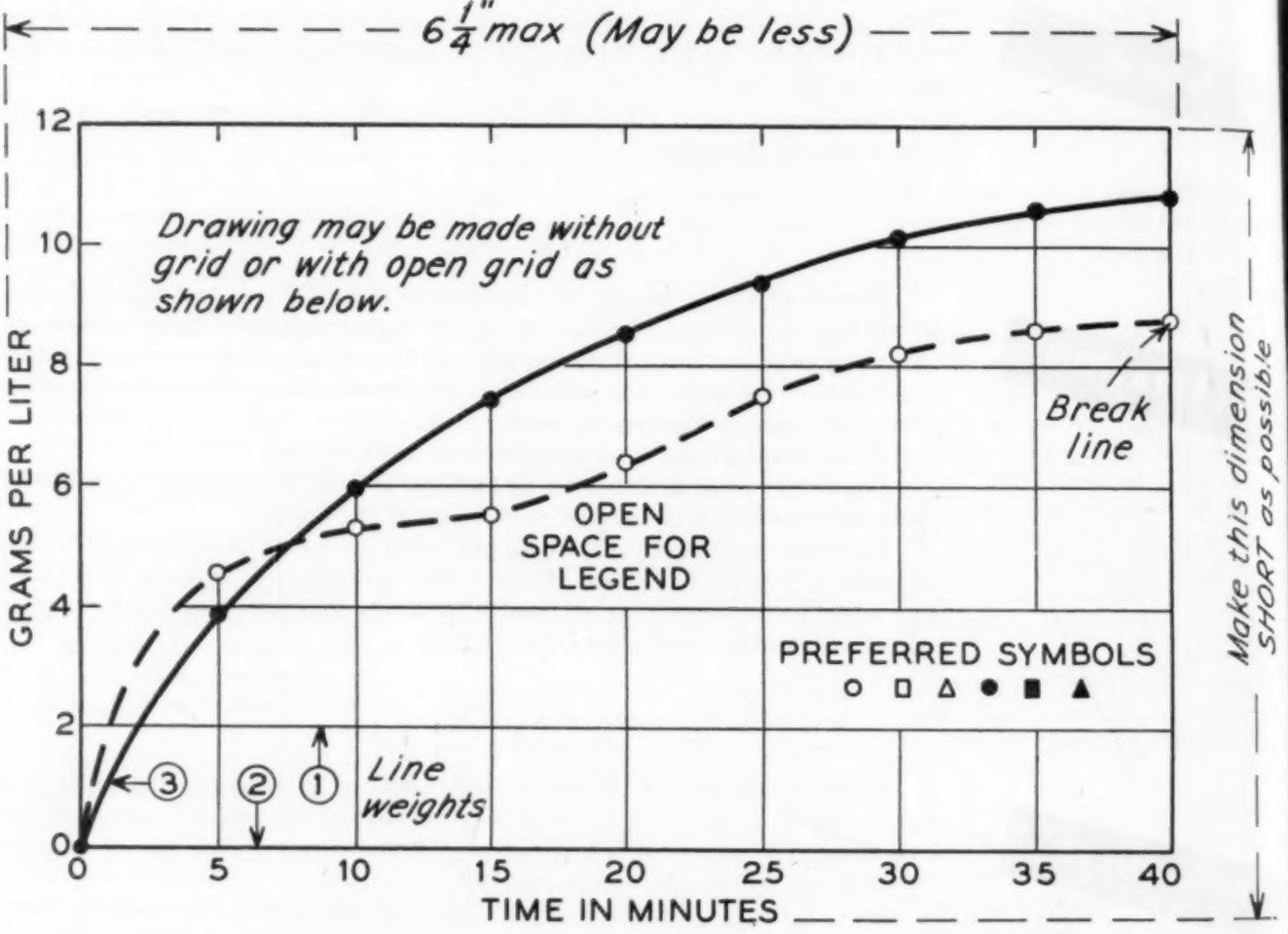
ABBREVIATIONS

Abbreviations should conform with the American Standards Association's list of "Abbreviations for Scientific and Engineering Terms."

GENERAL

Authors should be as brief as is consistent with clarity, and must omit all material which can be regarded as familiar to specialists in the particular field.

The use of proprietary names, trade-marks, and trade names should be avoided if possible. If used, these should be capitalized so that the owner's legal rights are not jeopardized.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